11.10 GROUNDWATER DATA COLLECTION

11.10.1 Purging Equipment and Techniques

A. GENERAL INFORMATION

Wells shall be purged before taking samples in order to clear the well of stagnant water that is not representative of aquifer conditions. The method of purging is to pump the well until three to five times the volume of standing water in the well has been removed and until the specific conductance, temperature, and pH of the groundwater stabilizes. Normally, a combination of the two methods is employed (i.e., specific conductance, tempera ture, and pH are measured at intervals and three to five volumes are purged). If a well is pumped dry, this constitutes an adequate purge and the well can be sampled following recovery. However, if possible, monitoring wells shall not be pumped dry. If the well is pumped dry, water that has been trapped in the sandpack may be sampled. In addition, as water reenters the well it may cascade down the well screen and strip volatile contaminants.

B. EQUIPMENT AVAILABLE

Monitoring well purging is accomplished by using in-place plumbing/pumps or when in-place pumps are not available, by using DEQ equipment; either a peristaltic, bladder, centrifugal, or other appropriate pump, depending on well depth. A Teflon, closed-top bailer may be used for purging; however, bailing may stir up sediment in the well if conducted improperly.

Other monitoring equipment used during purging includes water level indi cators, pH meters, thermometers, and conductivity bridges.

C. PURGING TECHNIQUES (WELLS WITHOUT PLUMBING OR IN-PLACE PUMPS)

1. General Information

For permanently installed wells, the depth of water shall be determined (if possible) before purging. This can be accomplished by attaching a weight on the end of a tape and lowering it into the well until it touches the water, or by use of a mechanical or electrical water level indi cator. DEQ per sonnel shall exercise extreme caution during this procedure to prevent contami nation of the groundwater. This is a critical concern when samples for trace organic compounds or metals analyses are collected.

2. Using Pumps to Purge -- When suction lift or

centrifugal pumps are used, only the intake line is placed into the water column. To minimize contamination, the line placed into the water is either standard cleaned Teflon (Appendix B of the Standard Operating Procedures DEQ Ground Water Program), in the case of the suction lift pumps, or standard cleaned stainless steel pipe attached to a hose, when centrifugal pumps are used.

When submersible pumps (bladder, turbine, displacement, etc.) are used, the pump itself is lowered into the water column. The pump must be cleaned as specified in Appendix B of the Standard Operating Procedures DEQ Ground Water Program.

3. Using Bailers to Purge -- Standard cleaned (Appendix B of the Standard Operating Procedures DEQ Ground Water Program) closed top Teflon bailers with Teflon leaders and new nylon rope are lowered into top of the water column, allowed to fill, removed then the water is discarded.

4. Field Care of Purging Equipment -- Regardless which method is used for purging, new plastic sheeting shall be placed on the ground surface around the well casing to prevent contamination of the pumps, hoses, ropes, etc., in the event they need to be placed on the ground during the purging or they accidentally come into contact with the ground surface. It is preferable that hoses used in purging that come into contact with the ground water be kept on a spool, both during transporting and during field use, to further minimize contamination from the transporting vehicle or ground surface.

5. Purging Entire Water Column -- The pump/hose assembly or bailer used in purging shall be lowered into the top of the standing water column and not deep into the column. This is done so that the purging shall "pull" water from the formation into the screened area of the well and up through the casing so that the entire static volume can be removed. If the pump is placed deep into the water column, the water above the pump may not be removed, and the sub sequent samples collected may not represent the ground water.
To reduce cross contamination between wells, no more than 0.9 to 1.5m (3 to 5ft) of hose shall be lowered into the water column. If the recovery rate of the well is faster than the pump rate, the pump may be left hanging at the initial level until an adequate volume has been purged. If the pump rate ex ceeds the recovery rate of the well, the pump must be lowered, as needed, to accommodate the drawdown.

After the pump is removed from the well, all wetted portions of the hose and the pump shall be cleaned as outlined in Appendix B of the Standard Operating Procedures DEQ Ground Water Program.

Careful consideration shall be given to using pumps to purge wells that are excessively contaminated with oily compounds, because it may be difficult to adequately decontaminate severely contaminated pumps under field conditions. When these type wells are encountered, alternative purging methods, such as bailers, shall be considered.

D. PURGING TECHNIQUES (WELLS WITH IN-PLACE PLUMBING)

1. General Information

In-place plumbing is found at water treatment plants, industrial water supply wells, private residences, etc. The objective of purg ing is t he same as with monitoring wells without in place pumps, i.e., to ultimately collect a sample representative of the ground water.

The volume to be purged depends on several factors: whether the pumps are running continuously or intermittently, how close to the source the sample can be collected, and the presence of any storage/pressure tanks between the sampling point and the pump. If storage/pressure tanks are present, an adequate volume must be purged to totally exchange the volume of water in the tank.

2. Continuously Running Pumps -- If the pump runs continuously, and the sample can be collected before a storage/pressure tank, no purge, other than opening a valve and allowing it to flush for a few minutes, is necessary.

3. Intermittently Running Pumps -- If the pump runs intermittently, it is necessary to determine the volume to be purged, including storage/pressure tanks that are located before the sampling location. The pump shall then be run continuously until the required volume has been purged.

11.10.2 Sampling Equipment and Techniques

A. EQUIPMENT AVAILABLE

Sampling equipment used by the Program in cludes Teflon, PVC, and stainless steel bailers, submersible centrifugal stainless steel pumps, and a bladder pump assembly.

Other monitoring equipment used during sampling includes water level indi cators, pH meters, thermometers, and conductivity bridges.

B. SAMPLING TECHNIQUES -- WELLS WITH IN-PLACE PLUMBING

Samples shall be collected following purging from a valve or cold water tap as near to the well as possible. Samples shall be collected directly into the appropriate containers (refer to Standard Sample Containers, Appendix A). Also, refer to the Potable Water Supply discussion in **Section 10.3.**

C. SAMPLING TECHNIQUES -- WELLS WITHOUT PLUMBING

Following purg ing, samples shall be collected using a Teflon or stainless steel bailer or a submersible centrifugal stainless steel pump. The pump used for purging generally shall not be used for sampling. All equipment shall be cleaned using the procedures described in Appendix B of the Standard Operating Procedures DEQ Ground Water Program. Also, refer to the Potable Water Supply discussion, **Section 10.3,** for additional information.

D. SPECIAL SAMPLE COLLECTION PROCEDURES

E. TRACE ORGANIC COMPOUNDS AND METALS

Special sample handling procedures shall be instituted when trace contaminant samples are being col lected. All sampling equipment, including pumps, bailers, water level measurement equipment, etc., which come into contact with the water in the well must be cleaned by the cleaning procedures described in Appendix B of the Standard Operating Procedures DEQ Ground Water Program. Pumps shall not be used for sampling, unless the interior and exterior portions of the pump and discharge hoses can be thoroughly cleaned. Blanks shall be collected to determine the adequacy of cleaning before collection of any sample using a pump. Samples for purgeable organic compounds analyses shall be collected with well bailers. The procedures given in the General Considerations, Special Precautions for Trace Contaminant Sampling **(Section 10.3)** shall be followed.

F. WELL PUMPING RATE - BUCKET/STOP WATCH METHOD

The pumping rate of a pump can be determined by collecting the flow of water from the pump in a bucket of known volume and timing how long it takes to fill the bucket. The pumping

rate shall be in gallons per minute. This method shall be used only with pumps with a constant pump rate, such as gasoline powered or electric submersible pumps. It shall not be used with battery powered pumps. As the batteries lose their charge, the pump rate decreases so that pumping rate calcu lations using initial, high pump rates are erroneously high.

G. VOLUME OF WATER IN WELLS

In order to purge wells, the volume of water in the well shall be known. To determine the volume, the following method shall be used. Measure the distance from the bottom of the well to the static water level, then measure the inside diameter of the well or casing. Obtain the volume of the well by the formula:

$$V = 0.041\ d^{2}h$$

Where: V = volume of water (gallons)
d = diameter of well (inches)
h = depth of water (feet)

If preferred, a quick reference nomograph or table may be used.

Additional groundwater related data can be obtained from most local, state, and federal agencies dealing with water resources. Some states require well drillers to be licensed, and all work performed on wells must be reported to the state on prescribed forms. These forms are available to the public, so a study of wells installed in the area of interest may provide background infor mation as to the subsurface conditions. State geological surveys, as well as the USGS, have various types of water related papers and reports on all phases of groundwater studies in each state.

City and county governments usually have departments that deal with water related projects that may provide data for the local area. Federal agencies such as the SCS, U. S. Army Corps of Engineers, the Bureau of Reclamation, U. S. Forest Service, Science and Education Administra tion, and the U. S. Public Health Service have water programs that may provide data. Other sources include the Bureau of Mines, colleges, universities, and technical societies such as American Association of Petroleum Geologists, American Institute of Mining and Metallurgical Engineers, American Water Well Association, Association of Engineering Geologists, and Geological Society of America.